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Student Achievement Testing Program Bulletin

Grade 3 Science

1990-91 School Year

Students First !

Student Evaluation

Alberta
EDUCATION
September 1990

This bulletin contains general information about the 1991 Student Achievement Testing Program and specific information about the Grade 3 Science Achievement Test. Additional copies of this bulletin may be obtained by telephoning Alberta Education at 427-2948.

DISTRIBUTION: Superintendents of Schools • School Principals and Teachers • The Alberta Teachers' Association • Alberta School Trustees' Association • Officials of Alberta Education • General Public Upon Request.

September 1990

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GENERAL INFORMATION

The Achievement Testing Program provides Alberta Education, school jurisdictions, and the public with information significant at the provincial and local levels about what students know and can do in relation to *Program of Studies*. It does not provide information to be used for student placement or promotion.

The achievement tests are administered on a four-year cycle in four subject areas: language arts, social studies, mathematics, and science; and at three grade levels: 3, 6, and 9.

The achievement tests are specific to the *Program of Studies* prescribed by the Minister of Education. Classroom teachers from across the province are extensively involved in developing and field testing the questions.

Information pertaining to the nature and administration of the Achievement Testing Program, exemptions, and students receiving instruction in French can be found in the *Achievement Testing Program General Information Bulletin*, 1990-91, which is being mailed to all superintendents and principals.

During 1991, the achievement tests will be administered according to the following schedule:

Tuesday - June 11, 1991

Grade 3 Science (a.m.)

Grade 6 Mathematics* (a.m.)

Grade 9 Social Studies* (a.m.)

* A French translation of this test is available and must be administered at the same time as the English test. Schools will be sent enrolment forms from Alberta Education by February 1991 requesting an indication of which test versions are required (English/French). These forms must be returned through jurisdiction offices by March 8, 1991.

Reporting Achievement Test Results

In October 1991, a provincial report will be issued that will present the overall results for the province on major curriculum dimensions. Each jurisdiction will receive a district profile of student achievement to parallel the provincial report, as well as guidelines for interpreting the jurisdictional results in relation to provincial standards. School jurisdictions and schools will receive reports based only on their students. Provincial results will be released publicly through the annual *Achievement Testing Program Provincial Report*.

DESCRIPTION OF THE GRADE 3 SCIENCE ACHIEVEMENT TEST

General Description

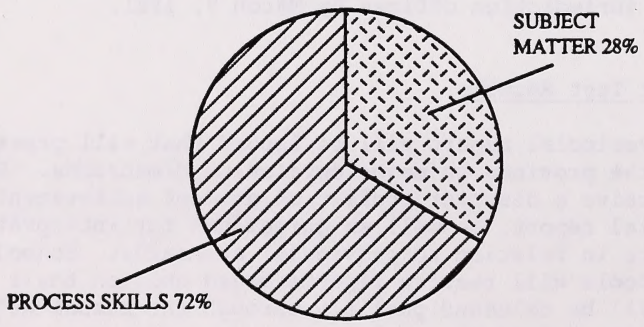
The time allotted for writing the Grade 3 Science Achievement Test is 50 minutes. Students will require HB pencils and erasers. The test consists of 50 multiple-choice questions and is divided into two parts of equal length in recognition of the need to provide Grade 3 students with a break. As a result, each part has 25 multiple-choice questions with a time allocation of 25 minutes. All questions have four alternatives. Students will answer each question in the test booklet by completely filling in a small machine-scorable circle beside or below the correct response. There is no separate answer sheet.

Content of the Test

The four major components of the Division I Science Curriculum and the emphasis that each is to receive according to the *Grade 3 Science Curriculum Specifications* (Revised, May 1986) form the basis for the achievement test. These are:

Component	Emphasis (%)
Process Skills	55
Subject Matter	20
Attitudes	15
Psychomotor Skills	10

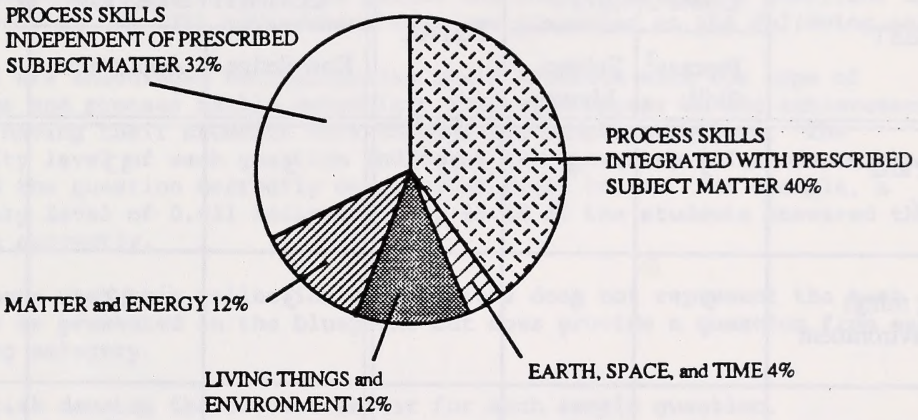
However, the scope of the Grade 3 Science Achievement Test is limited to those objectives that may be efficiently measured on a paper and pencil test. As a result, the psychomotor and attitude components of the Division I Science Curriculum are not assessed on this test. The blueprint for this test reflects the weighting proportioned to the process skills and subject matter components as illustrated in the circle graph below.



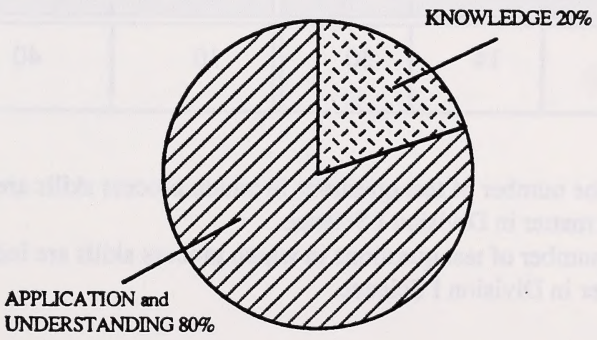
The subject matter component includes questions from each theme in the Division I Science core. These themes are listed below.

1. Matter and Energy
2. Living Things and Environment
3. Earth, Space, and Time

It should be noted that within the process skills component, all process skills will be represented. However, emphasis will be placed on observing, measuring, classifying, and communicating. In addition, the process skills component will consist of questions integrated with the subject matter. The emphasis given to each theme and to process skills is shown in the circle graph below.



The test questions represent the cognitive levels of knowledge, application and understanding. An explanation of these terms is given in the appendix. The emphasis given to each cognitive level is shown in the circle graph below.



The Grade 3 Science Achievement Test is based on Division I Curriculum Specifications and includes material covered in grades 1, 2, and 3. Thus, it is assumed that students are familiar with the terminology used in the curriculum specifications (e.g. observe, predict, measure, classify, mass, food chain, etc.).

Blueprint for the Test

The approximate emphasis by number of questions for each subtest, component, and cognitive level are presented below.

1990 Grade 3 Science Achievement Test

Blueprint – Question Distribution

SUBTEST	COMPONENT		TOTAL	COGNITIVE LEVEL[1]		TOTAL
	Process[2] Skills	Subject Matter		Knowledge	Application	
Matter and Energy	9	6	15	3	12	15
Living things and Environment	9	6	15	3	12	15
Earth, Space and Time	2	2	4	1	3	4
Process Skills[3]	16	–	16	3	13	16
TOTAL	36	14	50	10	40	50

1 Refer to appendix .

2 This column indicates the number of test questions in which process skills are integrated with prescribed subject matter in Division I Science.

3 This row indicates the number of test questions in which process skills are independent of prescribed subject matter in Division I Science.

Confirming Standards

Confirming standards is a process whereby teachers are asked to make judgments related to the achievement test to answer the question of whether province-wide performance is satisfactory. For more information on the confirming standards process, refer to Appendix C of the *Achievement Testing Program, Provincial Report, June 1990 Administration.* For information on the selection of teachers for participation in the confirming standards process, refer to the *Achievement Testing Program General Information Bulletin, 1990-91 School Year.*

SAMPLE QUESTIONS

Sample questions that reflect the nature and complexity of the questions that will appear on the 1991 achievement test are presented on the following pages.

Teachers are encouraged to familiarize their students with the type of questions and process skills vocabulary that will appear on the achievement test by having their students work through the sample questions. The difficulty level of each question indicates the percentage of students who answered the question correctly on previous field tests. For example, a difficulty level of 0.431 indicates that 43.1% of the students answered the question correctly.

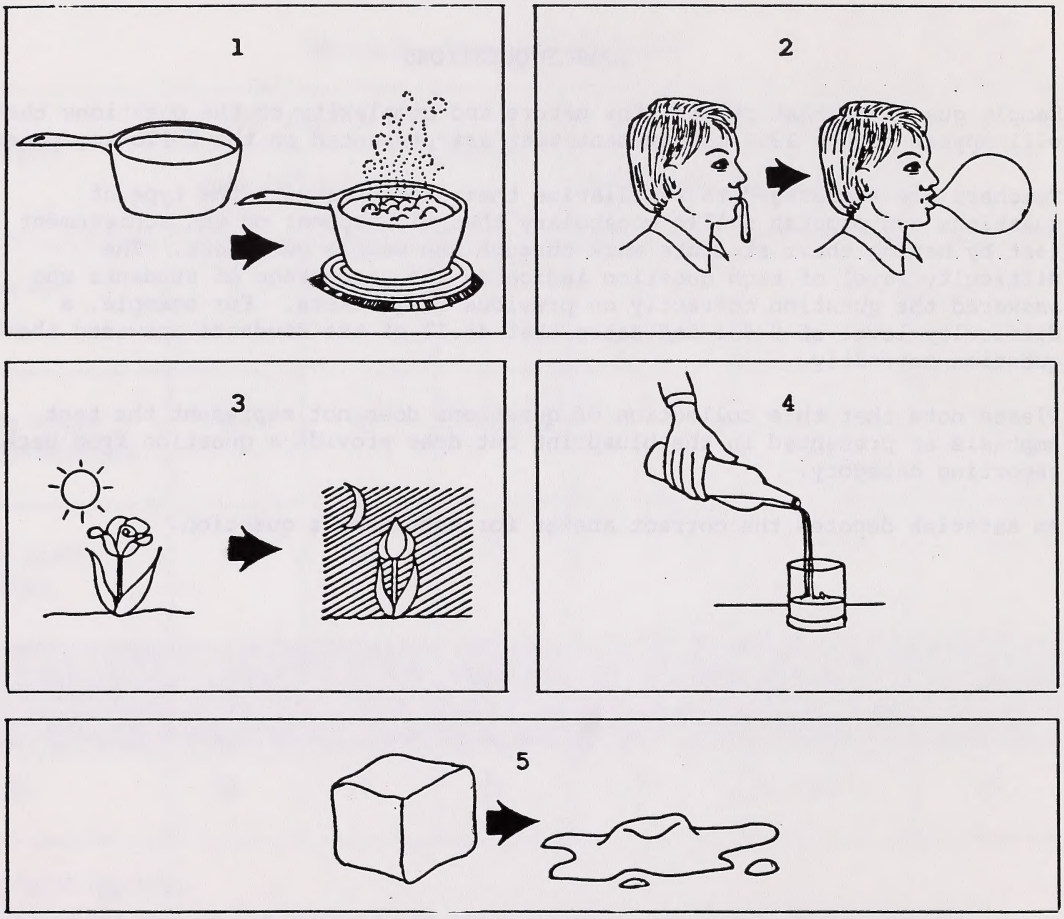
Please note that this collection of questions does not represent the test emphasis as presented in the blueprint but does provide a question from each reporting category.

An asterisk denotes the correct answer for each sample question.

Question 1

Concept: Matter and Energy
Subconcept: Properties of Matter - observe and describe matter undergoing changes such as freezing, melting, evaporating, heating, cooling.
Cognitive Level: Knowledge
Difficulty Level: 0.426

1. Which two pictures show a change in the state of matter?



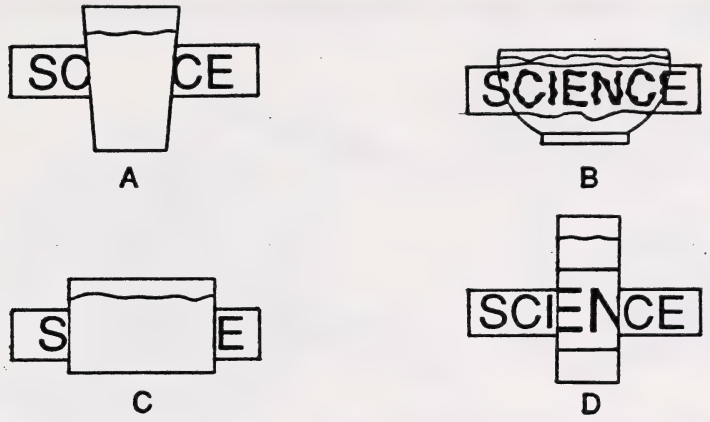
- O 4 and 5
- O 2 and 4
- * O 1 and 5
- O 1 and 3

In this question, students are required to know what is meant by a change in the state of matter and are asked to identify the pictures where changes in the state of matter have taken place.

Question 2

Concept: Matter and Energy
Subconcept: Properties of Matter - observe samples of liquids and classify them according to the degree of transparency to light.
Cognitive Level: Application
Difficulty Level: 0.730

2. Look at these pictures.



The liquids that are transparent are

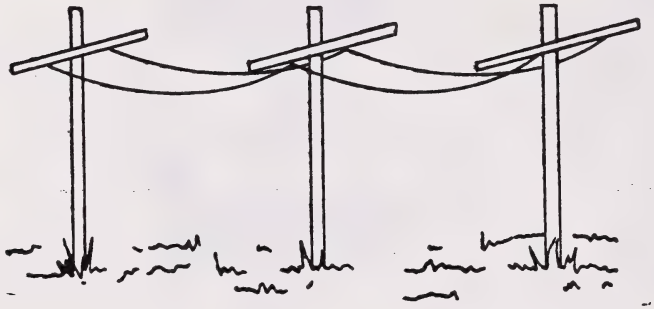
- O A and B
- O B and C
- O C and D
- *O B and D

In this question, students are required to recall the characteristics of transparent liquids and to observe the pictures and identify the liquids that have these characteristics.

Question 3

Concept: Matter and Energy
Subconcept: Properties of Matter - observe and describe matter undergoing changes such as heating and cooling.
Cognitive Level: Application
Difficulty Level: 0.474

3. In the summer, power lines sag because of the warm temperatures.



In the winter, the power lines will

O snap

O sag more

*O sag less

O stay the same

In this question, students are required to recall how matter can expand and contract with changes in temperature and predict how the power lines will change in winter.

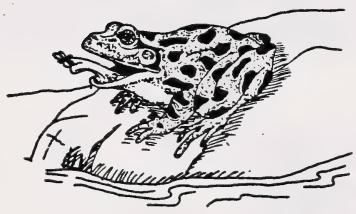
Question 4

Concept: Living Things and Environment
Subconcept: Environment - infer the consequences or outcomes of changes, both man-made and natural, which occur in the environment.
Cognitive Level: Knowledge
Difficulty Level: 0.850

4. Which picture shows how the environment could be harmed?

O

O



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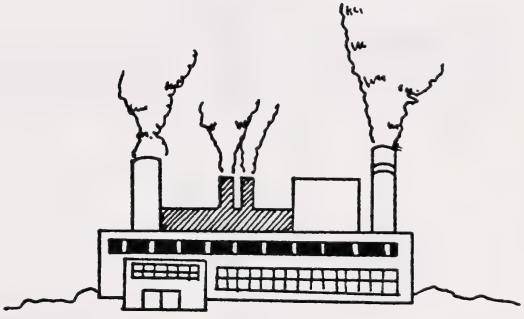


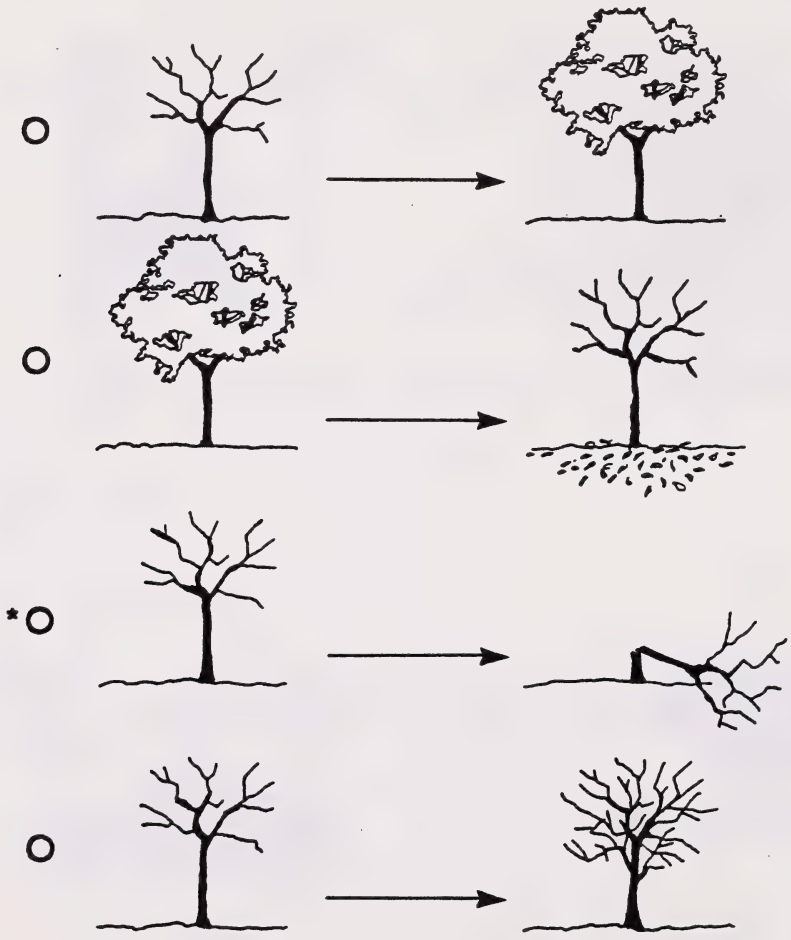
* O

In this question, students are required to recognize particular activities that may be harmful to the environment and are asked to identify the picture that shows how the environment may be harmed.

Question 5

Concept: Living Things and Environment
Subconcept: Environment - infer the consequences or outcomes of changes, both man-made and natural, which occur in the environment.
Cognitive Level: Application
Difficulty Level: 0.687

5. Which change was most LIKELY caused by people?

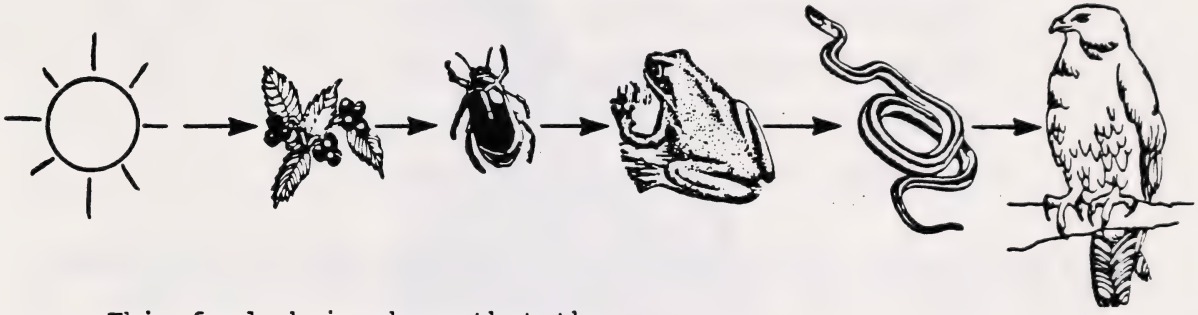


In this question, students are required to recognize changes in the environment that are man-made and are asked to identify an environmental change most likely caused by people.

Question 6

Concept: Living Things and Environment
Subconcept: Environment - identify various parts of an environment and begin to infer their interdependence.
Cognitive Level: Application
Difficulty Level: 0.675

6. Look at this food chain.



This food chain shows that the

* O plant receives energy from the sun

O sun receives energy from the plant

O snake receives energy from the hawk

O insect receives energy from the frog

In this question, students are required to understand the interdependence of various components of an environment and are asked to look at a picture of a food chain and infer the interdependence of its parts.

Question 7

Concept: Earth, Space, and Time
Subconcept: Order and Time - observe, describe, and order changes that occur in a regular pattern.
Cognitive Level: Knowledge
Difficulty Level: 0.701

7. The correct order for the seasons in one year is

O autumn, spring, winter, and summer

O summer, spring, autumn, and winter

O winter, summer, autumn, and spring

* O spring, summer, autumn, and winter

In this question, students are required to know the sequence of the seasons and are asked to identify the correct order of the seasons in one year.

Question 8

Process Skill Independent of Subject Matter: Observing - describing an object on the basis of sensory information.
Cognitive Level: Knowledge
Difficulty Level: 0.673

8. Sara has a can with an object inside it.

The BEST observation to be made about the object is that it

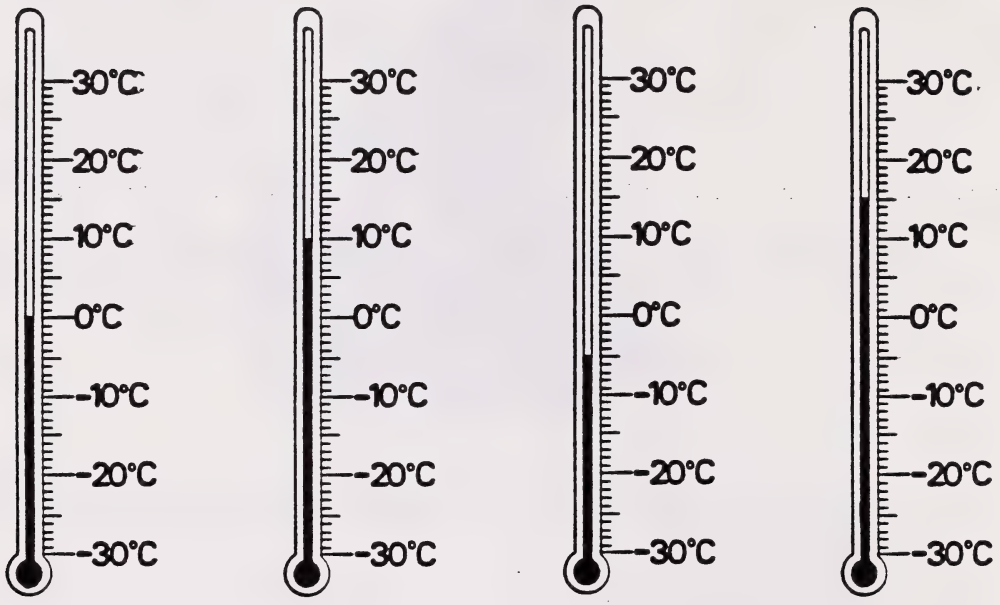
- O is round
- O is smooth
- O smells sweet
- *O fits into the can

In this question, students are required to know what an observation is and are asked to choose the best observation that can be made about the object in this picture.

Question 9

Process Skill Independent of Subject Matter: Measuring - ordering on the basis of comparative measurements.
Cognitive Level: Application
Difficulty Level: 0.587

9. Look at the thermometers.



Which of the following shows the order of days from coldest to warmest?

* ○ Wednesday, Monday, Tuesday, Thursday

○ Monday, Tuesday, Wednesday, Thursday

○ Wednesday, Monday, Thursday, Tuesday

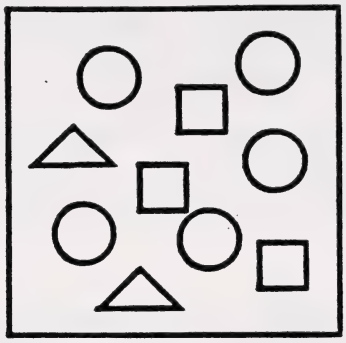
○ Thursday, Tuesday, Monday, Wednesday

In this question, students are required to read the temperatures on each thermometer for each day and order the days from coldest to warmest.

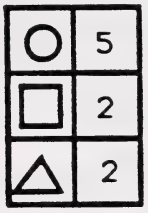
Question 10

Process Skill Independent of Subject Matter: Classifying - classifying objects according to shape.
Cognitive Level: Application
Difficulty Level: 0.671

10. A student is asked to sort these objects:



Which chart correctly shows the results of the sorting?



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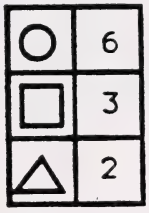

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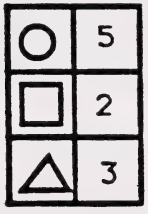

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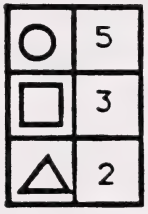


*O

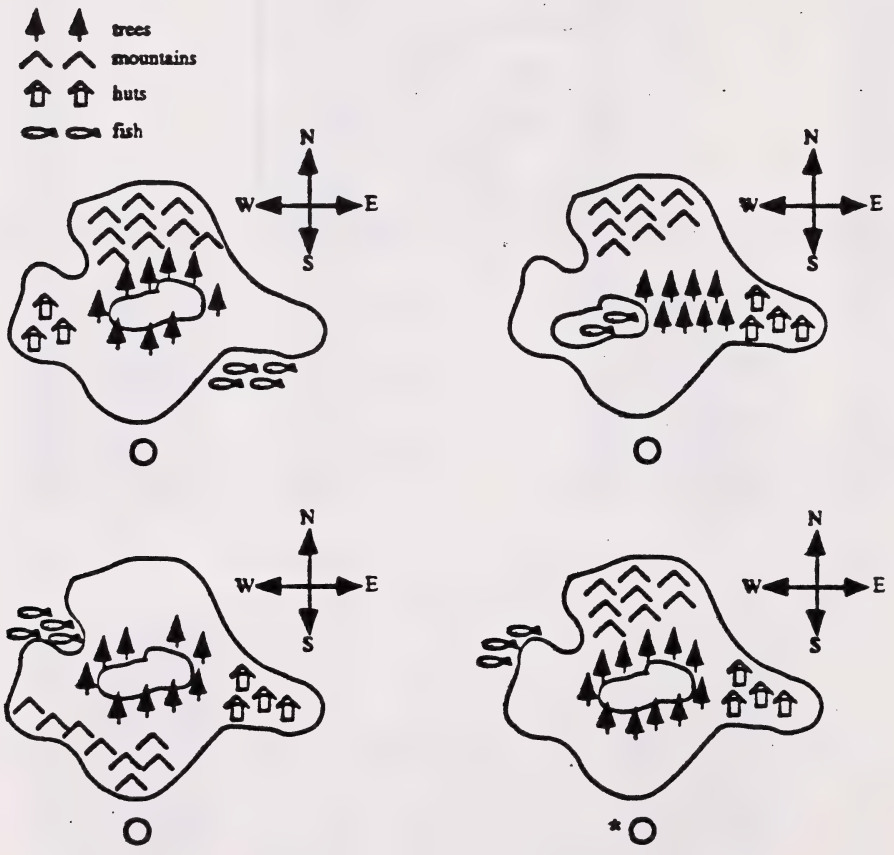
In this question, students are required to know the differences in the shape of the objects and are asked to identify the correct sorting of these shapes in a table.

Question 11

Process Skills Independent of Subject Matter: Communicating - drawing simple diagrams.
Cognitive Level: Application
Difficulty: 0.462

11. Aubrey was in a plane flying low over an island. She saw mountains to the north, a village on the east coast, fishing boats on the west coast, and a forest surrounding a lake near the centre of the island.

Which map shows what Aubrey saw?



In this question, students are required to know how symbols are used on simple maps and are asked to identify the map with the symbols that match the written description.

PERFORMANCE STANDARDS

Purpose of Performance Standards

The Grade 3 performance standards statements are intended to help educators develop a shared, province wide understanding of acceptable and excellent levels of achievement for Grade 3 Science.

Presented on the following pages are DRAFT statements that describe what is expected of Grade 3 students who are achieving an acceptable or an excellent level of performance on independent work at the end of the Grade 3 Science program. Once finalized, these statements will represent the standards of performance against which provincial and/or local levels of student achievement will be compared. By comparing actual provincial results with expected provincial performance standards, decisions can be made about whether achievement is in fact "good enough". The standards of performance inherent in these statements are derived from the goals and objectives Division I Science as presented in the *Program of Studies for Elementary Schools, 1982.*

Target Group

The Grade 3 Science course is intended for all students enrolled in the regular Grade 3 program.

Through discussions held with educators in developing the achievement tests, the expectation exists that 85 per cent of all students will meet an acceptable level of performance but only 15 per cent will achieve a level of excellence. We are interested in knowing if these standards of performance and the expectations of how many students will meet them are appropriate. Your view regarding these expectations would be appreciated.

Acceptable Level of Performance

Students who have achieved an acceptable level of performance in Grade 3 Science have an essentially accurate but narrow understanding of the conceptual and procedural knowledge that is fundamental to the program. For example, they may know how to make observations and how to measure and classify, but they have difficulty using the information obtained to predict or to infer beyond the available data. In addition, these students know many of the concepts inherent in Division I Science but encounter problems applying the concepts to new situations.

For their level of performance to be considered acceptable, students are expected to know the five senses and how each is used, classify familiar and unfamiliar objects into groups based on physical characteristics, make simple predictions, sequence events based on direct observations and past experiences, and recognize simple inferences based on interpretation of the data presented. Students are also expected to be able to read simple devices that measure temperature, volume, mass, length, and time. In addition, they should be able to calculate differences in measurements and make comparisons based on these differences. They must also know what a bar graph is and be able to construct one that is representative of the data presented.

Students at the acceptable level are expected to know about various sources of energy (heat, light, sound, and electricity) and be able to explain how energy can be conserved in their environment. They should know the characteristics associated with living and non-living things and be able to identify the correct sequence of plant and animal growth.

Level of Excellence

It is expected that students achieving a level of excellence in Grade 3 Science have internalized most, if not all, science concepts as outlined in Division I Science. These students are expected to have an accurate and broad understanding of the conceptual and procedural knowledge that is essential to succeed in the program. They should also be able to transfer this knowledge and understanding to real-life situations.

In addition to the performance expected at the acceptable level, students at the level of excellence should be able to classify living things based on direct and indirect observations, make predictions and inferences using unfamiliar data, and interpret communication represented by symbols in bar graphs, charts, and tables. Students are also expected to know how to interpret the meaning of symbols when used to represent unfamiliar data; for example, when ordering the relative mass of objects represented by symbols. These students should know the symbols used for measuring temperature, volume, mass, length, and time. They should also know the energy relationships that exist within a food chain, the concept of the change of state of matter, and that light can travel through some, but not all, solids, liquids, and gases.

ALBERTA EDUCATION CONTACTS

Questions or comments regarding this bulletin should be directed to:

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APPENDIX: EXPLANATION OF COGNITIVE LEVELS

1. Knowledge

   Knowledge is defined as those behaviors and test situations that emphasize the remembrance, either by recognition or recall, of ideas, material, or phenomena. This level comprises knowledge of terminology, specific facts (dates, events, persons, etc.), conventions, classifications and categories, and theories and structures.

2. Comprehension and Application

   Comprehension refers to responses that demonstrate understanding of the literal message contained in a communication. This means that the student is able to translate, interpret, or extrapolate. Translation refers to the ability to put symbols in a communication into language. Interpretation involves the reordering of ideas (inferences, generalizations, or summaries). Extrapolation is the ability to make estimates or predictions based on an understanding of trends or tendencies.

   Application requires that the students apply an appropriate abstraction (theory, principle, idea, and/or method) to a new situation.